

Claims 1, 2 and 4-15 are currently pending in this application. Claims 1 and 11 are the independent claims and are amended herein to more clearly recite the features of the invention. These amendments are supported by the originally-filed specification, for example at pages 9-11. It is submitted that no new matter has been added.

Claims 1, 2 and 4-15 were rejected under 35 U.S.C. § 103(a) as allegedly obvious over Okuma et al. (U.S. Patent No. 5,478,606) in view of Field et al. (U.S. Patent No. 3,852,222). Applicants disagree with this rejection and respectfully request reconsideration.

Before addressing the merits of the rejection, Applicants believe it will be helpful to review some features and advantages of the claimed invention.

The present invention addresses problems that arise when portions of an ink jet head that are in contact with ink (particularly flow paths and liquid chambers) change dimensions because of swelling. Problems caused by such swelling include deteriorated printing grade, and peeling off of part of the flow path wall due to stress caused by swelling. In the present invention, the fluorocarbon moiety-

containing compound having a functional group reactive to an epoxy resin is bonded to the curable epoxy resin compound. Thus, water absorption by recording head members such as a liquid flow path wall is reduced, solving the above-mentioned problems caused by swelling.

The invention of Claim 1 relates to a liquid jet recording head comprising a liquid flow path having a coating resin layer. The invention of Claim 11 relates to a process for producing a liquid jet recording head wherein a coating resin layer is formed. The coating resin layer is formed from a cured product of a resin composition comprising (1) a curable epoxy compound, (2) a compound having a functional group reactive to the curable epoxy compound and fluorocarbon moiety, and (3) a curing agent. The curable epoxy compound and the compound having a functional group reactive to the curable epoxy compound and a fluorocarbon moiety are polymerized. Applicants submit that the features of Claims 1 and 11 are neither taught nor suggested by the cited references.

Ohkuma et al. discloses a compound in which fluorocarbon is added to a main component epoxy resin.

However, the fluorocarbon cited by the Examiner is copper triflate or a cationic photopolymerization initiator, which is added as a catalyst. Although copper triflate and the cationic polymerization initiator are fluorocarbons, Applicants submit that neither is polymerized with the epoxy resin in the finally cured product. Applicants therefore conclude that the Ohkuma et al. composition would not ameliorate the water absorption problems of epoxy resin.

Applicants refer the Examiner to Example 3 and Comparative Example 2 of the present specification. A fluorocarbon-containing compound is used in Example 3, but fluorocarbon-containing compound as described in Applicants' invention is not used in Comparative Example 2; copper triflate is used in both. See Table 2 on page 25 of the specification. Accordingly, Applicants submit that Comparative Example 2 corresponds to Ohkuma et al. The test results show that even if copper triflate is present, if fluorocarbon-containing compound is not part of the resin composition, the advantages provided by the present invention cannot be obtained. See pages 21-22 of the specification.

Field et al. discloses a fluorocarbon moiety-containing compound and addition of the compound to an epoxy resin. The object of Field et al. is to obtain high water repellency. See column 1, lines 9-10. Applicants note, however, that in an ink jet head, if the portions that contact ink, such as flow path walls, have high water repellency, they are likely to hold bubbles, resulting in an adverse affect on ink discharge. In Applicants' view, one of ordinary skill in the art would not have been motivated to use the fluorinated epoxy resin of Field et al. as a coating layer for a liquid flow path. The present invention lowers the water absorbency of constituent portions such as flow path walls without exhibiting high water repellency. Applicants therefore conclude that even if Ohkuma et al. were combined with Field et al., the present invention showing the above-mentioned advantages would not result.

Accordingly, Applicants submit that the claimed invention is not taught or suggested by the cited references, either singly or in the combination proposed by the Examiner assuming, for the sake of argument, that the references can

properly be combined. Applicants respectfully request that the Section 103(a) rejection be withdrawn.


The dependent claims are deemed to be allowable for the reasons given with respect to independent Claims 1 and 11 and because they recite features which are patentable in their own right. Individual consideration of each dependent claim is respectfully solicited.

This Amendment After Final Rejection is an earnest attempt to advance prosecution and reduce the number of issues, and is believed to place this application in condition for allowance. No new claims have been added. Furthermore, Applicants respectfully submit that a full appreciation of these amendments will not require undue time or effort given the Examiner's familiarity with this application. Accordingly, entry of this Amendment under 37 C.F.R. § 1.116 is respectfully requested.

Applicants submit that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE CLAIMS

1. (Three Times Amended) A liquid jet recording head comprising:

a liquid flow path having a coating resin layer formed from a cured product of a resin composition comprising (1) a curable epoxy compound, (2) {a compound having a functional group reactive to the curable epoxy compound and a fluorocarbon moiety, } and (3) a curing agent,

wherein the curable epoxy compound and the compound having a functional group reactive to the curable epoxy compound and {a} fluorocarbon moiety are polymerized, and

wherein the compound having a functional group reactive to the curable epoxy compound and a fluorocarbon moiety is contained in the resin composition at a content ranging from 5% to 50% by weight.

11. (Twice Amended) A process for producing a liquid jet recording head, comprising the steps of:
(I) forming an ink flow path pattern from a soluble resin on an ink discharge pressure-generating element on a base plate,

(II) forming a coating resin layer on the soluble resin layer, and

(III) removing the soluble resin layer by elution, wherein the coating resin layer is formed from a cured product of a resin composition comprising (1) a curable epoxy compound, (2) a compound having a functional group reactive to the curable epoxy compound and a fluorocarbon moiety, and (3) a curing agent,

wherein the curable epoxy compound and the compound having a functional group reactive to the curable epoxy compound and a fluorocarbon moiety are polymerized, and

wherein the compound having a functional group reactive to the curable epoxy compound and a fluorocarbon moiety is contained in the resin composition at a content ranging from 5% to 50% by weight.